

Pacific Northwest National Laboratory

The Pacific Northwest National Laboratory has a User Experience Group that consists of Human Computer Interaction and User Interface Design staff. This group of people is in high demand and work in many domains across the laboratory. They contribute to the collection of user requirements, user interface design, and user evaluation of research and development projects through the laboratory. One of our primary capabilities is in the design and implementation of visual analytics. We develop interactive visualizations that are helpful in exploratory analysis of extremely large datasets. Members of our group participate in work in the power grid, search and rescue operations, design and use of visual analytics, cybersecurity and social media use. Examples of recent projects include:

- The design and evaluation of a model that provides a graphical means to guide users in the evaluation and investigation of identity in a more holistic manner across physical and digital identity attributes.
- The design and evaluation of a suite of visual analytic tools designed to support deep investigation of large multimedia collections. These tools combine the understanding of data represented in multiple formats: video, image, and text and presents that information to users through new visual representations. This has been shown to reduce analysts' workload and ultimately the effort of identifying critical intelligence for decision makers.
- The design and evaluation of an advanced analytic workbench and the mobile applications will 1) improve the understanding of disease baseline and event prediction related to human social, cultural, and behavioral data; environmental/climatological data; disease risk mapping; and 2) enable users to predict, alert, forecast and manage a bio threat event—whether emerging, endemic, or intentionally introduced—within 24 hours to minimize harmful impact to the warfighter and society.
- The implementation of a Scalable Reasoning System (SRS), an analytic framework for developing web-based visualization applications. Using a growing library of both visual and analytic components, custom applications can be created for any domain, from any data source.
- The Shared Perspective Project, part of the Future Power Grid Initiative, designed and implemented an actionable visualization tool for transmission operators to exchange information with neighboring utilities. Rather than relying on phone calls these displays are intended to be shared between regional control rooms to provide operators with a more global situation awareness of the power grid in their region. The displays were designed so that the amount of information being shared could be controlled by each individual control rooms. The display featured a geospatial map view that could be annotated. Iterative designs were produced based on feedback from a number of different operators in various utilities.
- There is a current effort to produce a human-in-the loop model to be used for testing the resiliency of Industrial Control Systems. This model will be used in conjunction with other simulations for testing.
- PNNL is also involved in several other projects involving the power grid. From the human point of view, we are focused on developing visualizations and visual analytics for transmission operators, distribution centers, and eventually home systems that can monitor and utilize various types of power. Another visualization system is looking at data from hydro systems and designing and integration data architecture to make this data browsable in a web system.
- PNNL is also supplying simulation data and tools to examine this data for teams developing algorithms to detect and isolate attacks on the power grid.
- Visual analytics displays have also been developed to take the results of simulations and help control system designers track the effects of various controls.

While some of these efforts are not direct studies of human cognition, the efforts in visual analytics focus on designing interactive visual systems that have been shown to facilitate humans in the exploration and analysis of large systems of data.